

ON THE VALIDITY OF GLISCHROCHILUS QUAD-
RISIGNATUS SAY.

(Coleoptera, Nitidulidae.)

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INTRODUCTORY

In nearly every collection of Coleoptera one will find under the name *Glischrochilus fasciatus* (or possibly under *Ips quadriguttatus*) a complex of two equally common species which can be readily and positively separated from each other by the shape of the basal spot of the elytra. One of these species is the familiar *fasciatus*. The other is *quadrisignatus*, recognized as a valid species by Say, who described it, and by Melsheimer and by Reitter, each of whom named a variety. *Quadrisignatus* has been suppressed as a synonym of *fasciatus* by later authorities, but absolute proof of the specific distinctness of the two forms exists in,

(1) The flagellum of the male genitalia, which is of entirely different structure in the two species.

(2) The elytral tips, which vary sexually in *fasciatus*, but not in *quadrisignatus*.

Anyone, even without special knowledge of Coleoptera, can readily and positively separate the two species by the shape of the basal spot of the elytra—there are no intermediate forms. The structural differences between the two species cannot be grasped as quickly, but are clearly recognizable, hold specifically constant over a large series of specimens, and once apparent, leave no doubt in the student's mind to which of the two species the specimen under examination is to be referred with respect to that particular character. Characters which were found to be of an indefinite nature permitting doubt to exist as to whether a specimen was one way or the other were summarily rejected, and have found no place in this paper. All of the structural characters here considered are being presented for the first time, all of those given in previous literature for the separation of these two species having been found useless.

In the preparation of this paper a large number of relaxed specimens, either in alcohol or soaked in hot water, were available for study. Every possible measure was taken to be accurate and positive. Wherever a characteristic seemed likely to prove a means of

separating the two species, series of specimens were examined first with a hand lens and then with a compound microscope; males of one species were compared with males of the other, and females were compared with females. No attempt was made to compare specimens opposite both in sex and species. Sexes in all cases were determined by extracting the genitalia; species were determined by the elytral pattern. At least forty males were tentatively identified by the elytral pattern and the determination checked by examination of the flagellum of the genitalia; in every case the first determination proved reliable. More than fifty females whose sex was ascertained by examining the genitalia were tentatively identified by the shape of the basal spot and in all cases the form of the elytral tips checked up with the determination based on the elytral pattern. In no case did the shape of the basal spot result in a determination which failed to agree with that obtained by examination of the flagellum of the male genitalia, the elytral tips, or the other structural characters presented in this paper.

Wherever a character was noted which seemed likely to prove of value in separating the two species the part in question was dissected from a number of specimens and viewed from every possible angle. Several characters which at first seemed suitable for the separation of the species were rejected because they were inconstant with the respective species, and two characters (form of clypeus, and shape of hind angles of thorax) which do present some constant variation in the two species were rejected as being of doubtful value since the angle at which the part in question was viewed gave an illusion of the differences that actually existed.

All of the specimens examined for the preparation of this paper were obtained at the same locality, Avenel, New Jersey. Over a thousand specimens were available for comparison, but only two hundred specimens were actually soaked, dissected, and examined as to the genitalia.

Specimens from New York, Tennessee, Alabama, and Maine were also examined, and found to agree with the New Jersey material in all external characters, but this material was not used in the actual preparation of this paper, nor in making the drawings of the genitalia.

Both species occur in about equal numbers; they are most common about freshly decaying fruit, or moistened grain; early in the spring at sap and at carrion; rarely under stones or other cover,

or on the wing. Both species occur mixed up together, sometimes one species, sometimes the other, being more abundant.

The males of *fasciatus* are more common than the females, outnumbering them about two to one, while the females are more numerous in *quadrisignatus*, outnumbering the males in about the same ratio. Unusual as this may seem, the fact is confirmed by both large and small series of specimens.

Horn, in his "Revision of the Nitidulidae of the United States" (Trans. Am. Ent. Soc. VII, 1879), followed by Blatchley, "Coleoptera of Indiana," page 649 (under *Ips quadriguttatus*) states that the tips of the male elytra are oblique, those of the female rounded.

Determination of the sexes by the genitalia shows that it is the female that has the oblique elytral tips, which are prolonged and pointed, and somewhat sinuate; the male has the elytral tips rounded. Furthermore, this applies only to *fasciatus*; in *quadrisignatus* they are the same in both sexes, squarely truncate, with rounded corners, and distinctly shorter on the sutural side.

The illustration in Blatchley's "Coleoptera of Indiana," as *Ips quadriguttatus*, represents *quadrisignatus* and not *fasciatus*.

In the following table for the separation of the species, the shape of the basal spot of the elytra (as described in *italics*) is all that is necessary for positive determination of material.

KEY FOR SEPARATION OF GLISCHROCHILUS FASCIATUS AND
QUADRISIGNATUS.

A. *Basal spot of elytra large, trilobed, never divided, reduced, or lacking, brilliant orange in color; apical spot directly in a line beneath the basal spot, and midway between the suture and the sides of the elytra; sinuous, as if composed of two spots closely fused together. General form of insect broad, convex, stout; thorax on the whole slightly broader than the elytra on the whole; side margins of thorax broad, but very slightly reflexed; punctuation of entire upper surface very fine; tips of elytra in female oblique, prolonged, and pointed; in male, tips transverse, rounded.*

G. fasciatus Oliv.

B. *Basal spot of elytra subrectangular, oblique, sometimes slightly lunate, partly enclosing the humerus, never trilobed; sometimes divided, reduced to one or two fine points; rarely apparently lacking; spots pale yellowish in color, except in some small specimens with divided basal spot, where they are sometimes*

reddish (never orange). Apical spot small, oval, not sinuous, does not appear to be composed of two closely fused spots; not directly beneath the basal spot but conspicuously more sutural, and nearer the suture than to the outer margin of the elytra; general form of insect smaller, narrower, flatter, and more parallel than in *fasciatus*; thorax not wider than the elytra, but its sides taken together with those of the elytra make parallel lines; thoracic margins narrower but more evidently reflexed than in the preceding species; punctuation of upper surface coarser than in *fasciatus*; elytral tips similar in the sexes, truncate, distinctly shorter on the sutural side than on the outer side.

G. quadrisignatus Say.

LIST OF DESCRIBED SPECIES AND VARIETIES, WITH SYNONYMY.

Glischrochilus (Nitidula) fasciatus Oliv.

Antoine G. Olivier—"Entomologie II," No. 12, p. 7, Paris, 1790.

The original description is extremely short, repeating the same thing in French and in Latin. No structural characters are given which distinguish it from the other species of the genus. An illustration (Pl. 2, Fig. 13) accompanies Olivier's description. The elytra are described as being yellow, with a crossband at the middle, the apex, and the exterior basal angles black. Type locality—Georgia and the Carolinas.

The rather minute, but beautifully colored illustration, showing the large, broad, fasciate basal spots, and the description which considers the insect yellow with black stripes rather than black with yellow stripes clearly identify this species. It leaves no doubt as to which of the two species at present confused under this name *fasciatus* really refers.

The shape of the basal spot varies as follows:

(a) Usually large, broad, rounded, with the inner side of the spot parallel with the suture, not at all, or very slightly emarginate, giving the two spots together the appearance of a broad yellow crossband interrupted only at the suture. This is the typical *fasciatus*.

(b) Sometimes the basal spot is the shape of an irregular "X" with the upper outer arm missing, due to the deep emargination of the sutural margin of the spot. This results in a distinctly maculate rather than vittate form. It is the variety *4-maculosus*

Melsh. (Friedrich Melsheimer—Proc. Ac. N. S. Phila., II, p. 108, Oct., 1844.)

The two varieties of *fasciatus* merge into each other, as do most color varieties of beetles, but there is no approach to the form of the spots that occur in *quadrisignatus* and the variation in this species as noted above is the only variation present in the species. The basal spots are never divided, reduced or lacking, nor is the apical spot ever absent.

Specimens of the variety *4-maculosus* tend to be smaller in size, and are often females.

Gischrochilus (Ips) quadrisignatus Say.

Thomas Say—Desc. New N. A. Coleopt. in Bost. Journ. N. J., I, p. 169, 1835.

The original description is rather short; it includes few structural details, none of which are of the slightest value in distinguishing this species from *fasciatus*; the basal spot is described as "arcuated so as to enclose the humerus" and again as "uniformly small"; the apical spot is described as "transversely oval, not sinuated," which clearly identify the species.

The basal spot is often divided, sometimes the two parts being loosely joined; sometimes the basal spot is reduced to two minute linear points, or even to a single minute dot. The form in which the basal spot is divided or greatly reduced is the variety *similis* Melsh. (Friedrich E. Melsheimer, Proc. Ac. N. S. Phila., II, p. 108, Oct., 1844.)

Specimens sometimes occur in which the basal spot is apparently lacking, but close examination will always reveal a minute spot. In specimens in which the basal spot is greatly reduced, the apical spot is often smaller and more roundish.

Very small specimens of the variety *similis* always have the basal spot reduced to two or one small, minute, often linear points, which are sometimes reddish rather than yellow in color; these specimens are also more shining, somewhat more coarsely punctured, and have the vestiges of elytral striae a little more evident. They are almost always females, and were described by Reitter as *Ips quadrisignatus* var. *sexpustulatus* ("Syst. Eintheil, Nitid." in Verh. Nat. Vereins Brunn., XII, page 161, 1873). There is no adequate reason why this form should not be considered a synonym of the variety *similis* Melsh. *Sexpustulatus* was described from Florida.

Intermediate forms between typical *quadrisignatus* and the variety *similis* occur, but there is no variation other than that already mentioned, and the spots never approach in form those of the true *fasciatus*.

Glischrochilus (Ips) bipustulatus Melsh.

Friedrich E. Melsheimer—Proc. Ac. N. S. Phila., II, p. 108, Oct., 1844.

The original description is comparatively detailed, with several structural characters, none of which show any constancy when a large series is examined. It is supposed to differ from *quadrisignatus* by its inferior size and more quadrate contour, but it is undoubtedly a synonym of *quadrisignatus*. Described from Pennsylvania.

Glischrochilus (Ips) geminatus Melsh.

Friedrich E. Melsheimer—Proc. Ac. N. S. Phila., II, p. 108, Oct., 1844.

This species seems to be described from a single teneral specimen; the basal spot is described as composed of three roundish closely connected ones; the posterior one is composed of two oval or roundish ones. It is supposed to be more oblong than either *fasciatus*, *quadrisignatus*, *bipustulatus* and *sanguineolentus*. It is evidently a synonym of *fasciatus*, the type being possibly a female, which on account of the peculiarly produced elytral tips, would have a more oblong appearance. Described from Pennsylvania.

Glischrochilus (Ips) quadriguttatus Blatch. nec Fab.

Willis S. Blatchley—"Coleoptera of Indiana," p. 649, 1910.

This name refers to both *fasciatus* and *quadrisignatus*; a mis-determination, the true *quadriguttatus* Fab. being European. The European species of this name does not resemble either of our species in the least; it is extremely small, narrow and parallel, even more so than our *quadrisignatus*; the basal spots are quadrate, a little broader behind, not at all oblique or lunate; the apical spot is almost round and very little behind the middle. The thorax is flattened and decidedly narrowed basally, which character will readily distinguish this species from all the others mentioned in this paper.

The European *quadripunctatus*, however, comes pretty close to our *fasciatus* in general form, shape of the thorax, and shape of the spots. The basal spot is almost exactly as in the variety *4-maculosus* and the apical one is very evidently composed of two closely fused spots. This species, however, is conspicuously

smaller than our *fasciatus*, and though as convex, is much narrower.

Glischrochilus geminatus, and the varieties *4-maculosus* and *similis*, all described by Melsheimer were omitted from the Leng Check List.

IMPRESSIONS ON HEAD.

According to Reitter, in a footnote to his description of *Glischrochilus quadrisignatus* var. *sempustulatus*, loc. cit., there are four small impressions on the head of *quadrisignatus*, arranged in a transverse row, whereas in *fasciatus* there are only two, the inner ones being absent.

The inner impressions of the head vary from altogether absent to quite distinct, and are usually broad, shallow and very vague. They are difficult to see if the light does not strike the head at just the proper angle, and cannot be distinguished at all if the specimen is dusty. They seem to be more regularly present in *quadrisignatus* than in *fasciatus*, and when absent can be supplemented by a very slight exercise of the imagination. I was misled at first, believing that the number of impressions on the head presented a constant character for the separation of the two species, but the examination of a large series of specimens shows the character to have no specific constancy. There are at hand some perfectly clean specimens of *quadrisignatus* which show absolutely no trace of the inner depressions on the head, no matter in what light the specimen is held, as well as a number of specimens of *fasciatus* which show them as clearly as any *quadrisignatus*. Furthermore, the specimen which shows these impressions most distinctly happens to be a *fasciatus* and not a *quadrisignatus*, the specimen in question being a male from Millinocket, Maine.

GENITALIA.

Males can be distinguished from females in both species in that the outer portion of the genitalia (Fig. 3) usually projects beyond the apex of the last abdominal segment through the anal orifice. The projecting part is broadly rounded and densely pubescent at the tip. It appears to be an additional (sixth) abdominal segment, but removal of the piece in question, and close examination of its structure would not lead anyone to identify it

as such. As a means of determining the sex of a given individual it is of doubtful value, since it might be retracted entirely within the abdomen, and thus be invisible from the outside.

The genitalia of the female (Fig. 6) do not present any specific variations, and vary individually even more so than the male genitalia. Superficially the female genitalia are very similar in the rest of the Nitidulidae, and in certain other families, including Elateridae.

In *quadrisignatus*, which is figured, the transverse terminal pieces are usually each as long as the two longitudinal pieces together are wide, whereas in *fasciatus* each terminal piece is about as long as one of the basal pieces is wide, but this character is variable, and cannot be used for the separation of the species. *Fasciatus* usually has the bulbous fleshy part at the base of the female genitalia more inflated but this likewise presents no adequate specific distinction.

The genitalia of the male consist of a large outer portion bearing a short strut (Fig. 3), the basal piece (Fig. 1) with an opening at the bottom through which slides the median lobe (Fig. 2), an elongate piece with a long terminal strut, and bearing a long, white, opaque, non-chitinized, gut-like internal sac (not figured), the proximal end of which contains a minute, hard, chitinized body, the flagellum (Figs. 4 and 5.).

An illustration and description of the male genitalia of *Glischrochilus japonica* have been published by Sharp and Muir in Tr. Ent. Soc. London, 1912, in a paper entitled, "The Comparative Anatomy of the Male Genital Tube in Coleoptera."

An illustration and description of the male genitalia of *Glischrochilus obtusus* together with a description of the genitalia of a species identified as *fasciatus* have been published by J. W. Wilson in the Annals of the Ent. Soc. of Amer., Vol. XXIII, June 1930, in a paper entitled, "The Genitalia and Wing Venation of Cucujidae and Related Families."

Both of these illustrations were prepared for purposes of comparative morphology, and not for the separation of species. There is nothing in Wilson's description of the genitalia of *fasciatus* by which to tell whether it is the true *fasciatus* or *quadrisignatus*.

Both authors illustrate the genitalia with but one figure, a side view of the median lobe, with the attached internal sac, swinging through the opening in the basal piece. The flagellum is not shown in the illustration of either species, probably because it is lacking in both *obtusus* and *japonicus*; neither is the outer portion of the genitalia shown, represented in Fig. 3 of this paper.

The male genitalia of *quadrisignatus* and *faciatus* do not vary in the form of the outer portion, the basal piece, or the median lobe (Figs. 1 to 3).

Wilson gives adequate differences between the genitalia of *obtusus* and *fasciatus* on pages 324-325 of the paper already mentioned, the chief of which are that in *obtusus* the internal sac is enlarged to form a bulb-like structure at the proximal end, whereas this is not the case in *fasciatus*, and that the latter species contains a flagellum at the proximal end of the internal sac, which is not present in *obtusus*.

In other respects the median lobe and basal piece of *obtusus* and *japonicus* are very similar to those parts in *fasciatus* and *quadrisignatus*, the differences being only a matter of comparative proportions.

Outer Portion of Genitalia (Fig. 3): May be mistaken for an additional 6th abdominal segment; consists of a large, broad, chitinized portion, flat but very concave, with broad, reflexed margins on the inner side. The inside is filled with fleshy matter, and a short, stiff, chitinized strut projects from it. The distal end is broad, rounded, and bears numerous setae. This portion of the genitalia is not connected with the remaining portions.

Basal Piece (Fig. 1): Chitinized, convex, curved when viewed from the side, rather elongate, truncate and setose at the distal end, proximal end flattened, Y-shaped, with a large opening through which the median lobe swings.

Median Lobe (Fig. 2): Heavily chitinized, convex, solid, curved when viewed from the side; slides through the opening at the proximal end of the basal piece, the convex part of the median lobe fitting against the concave side of the basal piece. The median lobe bears a long, stiff, chitinized median strut, thickened at the end. This strut is really composed of two closely applied pieces which can be forced apart. The illustrations by Sharp and Muir, and by Wilson do not show the double nature of this strut. Four poorly defined lobes project through the dorsal surface near the distal end; they are closely fused together and to the remainder of the median lobe, and barely project above its surface. The more distal of the four are smaller, and project beyond the tip of the median lobe as two minute points. At each side of the median strut, near the base, there are two short, chitinized, flattened, curved, ribbon-shaped pieces, more or less obscured by the membranous tissue of the internal sac.

Internal Sac: A long, fleshy, non-chitinized, gut-like portion, extending from the base of the median lobe parallel with and for about the length of the medial strut. This organ is figured in the illustrations of Sharp and Muir and of Wilson, but not in this paper, it being beyond the scope of the subject in hand to consider the fleshy anatomy of the insects.

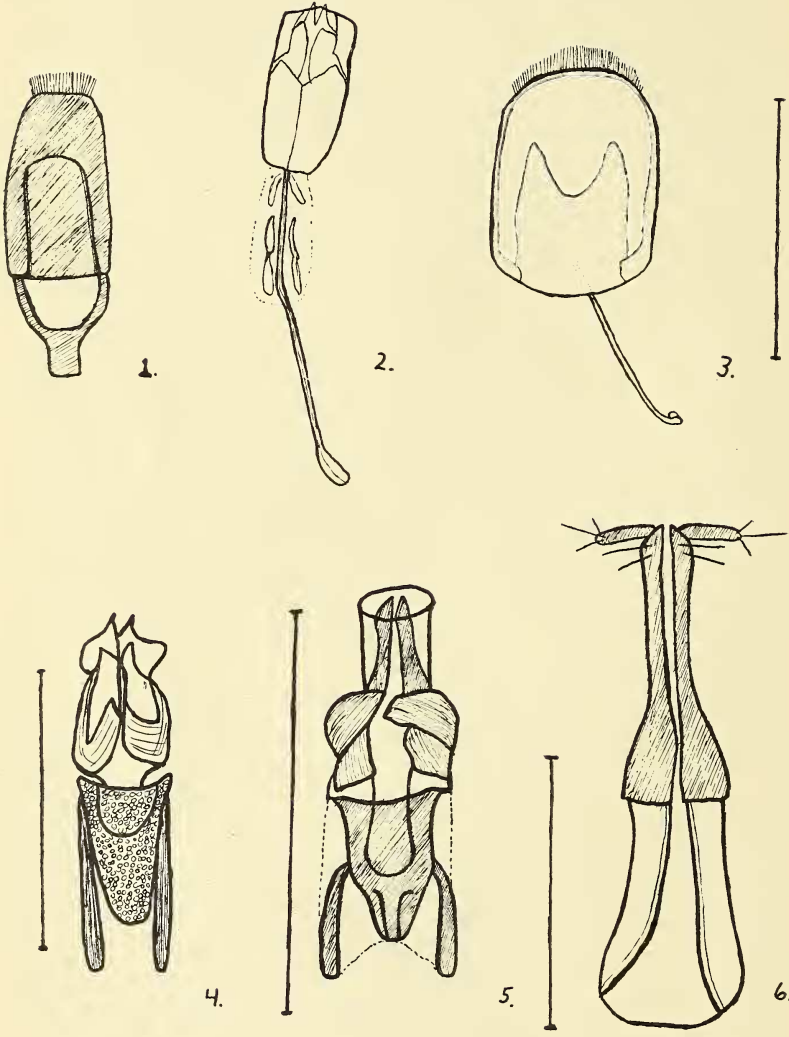
Flagellum (Figs. 4 and 5): The flagellum is present in a number of isolated genera of Coleoptera and usually exists as a fine, whip-like organ at the proximal end of the internal sac. According to Wilson, it is not present in *G. obtusus*, but he says of *fasciatus*, "Internal sac with a large irregular structure at the proximal end, the flagellum. This flagellum almost completely fills the internal sac."

The flagellum is the only part of the genitalia that varies specifically in *fasciatus* and *quadrisignatus*, the differences being not a mere matter of comparative lengths and widths, but a total difference in structure. There is no need of detailed description, the illustrations, Fig 4 representing *fasciatus*, and Fig. 5 representing *quadrisignatus* doing full justice to this organ.

Whether this organ, which remarkably resembles complete genitalia of the form present in the males of certain families of Coleoptera, is a true "flagellum" or not is somewhat doubtful, though it is so named by Wilson, who seems to be the only student to have discovered it. The flagellum in other Coleoptera is whip shaped, and very simple in structure.

The flagellum, on account of its minute size may possibly be overlooked when examining the genitalia, or may even be broken off together with some of the internal sac when they are pulled out. It can be recognized as a darker spot at the proximal end of the internal sac, opposite the inflated tips of the median strut. The use of a little potassium hydroxide causes it to darken a little in color, and assists in removing the fleshy portions of the internal sac which obscure its visibility. All these fleshy parts must be picked away with a pin before the flagellum can be studied in detail, but in a moistened specimen the form of this organ can usually be made out sufficiently to determine whether it is of the *fasciatus* or the *quadrisignatus* type.

When the flagellum of *fasciatus* is viewed endwise, the extremities of four broad outer lobes are seen. When the same part of *quadrisignatus* is viewed from the end, one looks into a hollow



funnel, from the inside of which two sharp points project. There are four lateral lobes on the flagellum of *fasciatus*; only two on that of *quadrisignatus*.

The dotted lines on the illustration of the flagellum of *quadrisignata* represent the membranous material which envelopes the entire lower half of that organ and holds it together.

EXPLANATION OF PLATE II.

- Fig. 1. Basal piece, dorsal view (*G. quadrisignatus*, male).
- Fig. 2. Median lobe, dorsal view (*G. quadrisignatus*, male).
- Fig. 3. Outer portion of genitalia (*G. quadrisignatus*, male).
- Fig. 4. Flagellum (*G. fasciatus*, male).
- Fig. 5. Flagellum (*G. quadrisignatus*, male).
- Fig. 6. Genitalia of female (*G. quadrisignatus*).

Line to the right of Figures 1 to 3 represents one millimeter.

Lines to the left of Figures 4, 5 and 6 represents one-half millimeter.

***Sphecius speciosus* Drury.**—On the 2nd day of August, 1930, at Robbinsville, N. C., over thirty specimens of this insect were seen, thirteen females and seven males being collected. They were chasing each other three and four at a time, then came to rest on leaves of blackberry briars. The following day I returned and spaded out the burrow of a large female, which I found in the brood chamber. She was placed in a glass jar where I was trying to get her to lay some eggs, but to my surprise she stung herself and died. This is my first observation on insect suicide.—S. B. DENTON, Robbinsville, N. C.

***Ischalia costata* Lec.**—Although this beetle has been recorded from widely separated localities, I have never seen a live specimen but once. One was taken in Sherborn, Mass., on June 17, 1930, while sifting leaves taken from beside a large fallen limb near the edge of a woods of heavy growth.—C. A. FROST, Framingham, Mass.